Specification Objections

The Examiner has objected to the specification as containing specifically noted informalities. Applicant thanks the Examiner for his close reading of the claims and has amended the wording of the specification to overcome the specified informalities.

Claim Objections

Claims 9-11 are objected to as reciting "supporting structures" which is argued as being unclear language. Applicant has amended independent claim 9, to provide clarifying language, and, as so amended, along with its dependent claims 10-11, is now believed to overcome the stated objection. Accordingly, withdrawal of the objection is respectfully requested.

Claim 13 is objected to as requiring the use of the term 'an' in lieu of the term 'the'. This change in wording has been incorporated into an amended claim 13 which is now believed to overcome the objection. Accordingly, withdrawal of the objection to claim 13 is respectfully requested.

Claim 14 is objected to as being of improper dependent form. Claim 14 is canceled, thereby rendering the objection moot.

Claim Rejections – 35 USC 112

Claims 1-8 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention in the cited claims for specified reasons.

Specifically, the claims are argued to be unclear whether they are for a digital

radiography imaging system, or for a radiation sensor intended for use with a digital radiography imaging system. In response, Applicant, has amended claim 1, from which the other cited claims depend, adding clarifying language that the claims are directed toward a digital radiation sensor intended for use with a digital radiography imaging system and not, in these claims, for an overall digital radiography imaging system that includes as an integral element the described digital radiation sensor. Other claims, appearing later and having appropriate structural claim language, are directed toward a digital radiography imaging system having, among its specifically claimed elements, a digital radiation sensor. Applicant believes that the amended claim language, as well as these clarifying comments, suffice to overcome the stated rejection of claims 1-8 as noted above, and withdrawal of the rejection of these claims is respectfully requested and the claims passed to allowance.

Claim Rejections – 35 USC 103(a)

Claims 1-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 1,286,251 to Dorr in view of U.S. Patent No. 4,941,164 to Schuller et al. ("Schuller").

Dorr provides a "Mouth Film-Holder" that acts as an interchangeable holder for positioning and retaining skiagraph film in the mouth of a subject for the purpose of receiving an impression of teeth, tooth roots, or external jaw structure above or below a line of closure. It is not a sensor itself.

Claim 1, upon which the other cited claims depend, has been amended to clarify and distinguish more clearly over the Dorr reference.

Specifically, claim 1 claims a digital radiation sensor for use with a digital radiography imaging system for intraoral placement in a mouth of a patient for production of radiographs of teeth and supporting structures. Applicants' digital sensor has a digital imaging surface oriented toward a radiation source and is contained in a housing angled to conform to the anatomic curvatures of the human maxillary and mandibular arches of the average patient. This sensor, as claimed, provides a digitized data output representing the projected image of a fiduciary element, as well as teeth and their anatomical supporting structures of bone, periodontal ligaments and gingiva around the root and cervical region of the tooth made on the sensor's digital imaging surface for use in a digital radiography imaging system that uses the projected distorted image shape of the fiduciary element onto the sensor's digital imaging surface for comparison against a known non-distorted projected image shape of the fiduciary element in order to generate a corrective transformation for correcting projected distortions in the data representing the projected images on the sensor's digital imaging surface.

Dorr fails to teach a digital sensor having a digital imaging surface or digitized data output as claimed. Dorr, issued in 1918, well before the advent of digital technology, is limited to teaching an improved means for holding a skiagraph film, an analog medium of recording images lacking any digital output. Dorr's analog media, i.e., skiagraph film, is removed from the holder and itself contains the images of interest for inspection. There is no digitized data output from Dorr's structure nor is any method of adding any such data output, digitized or analog suggested. Dorr's structure cannot be substituted successfully for that being claimed by Applicants to produce a functioning replacement for Applicants' claimed structure as Dorr's analog media does not lend itself

to a digital output as specified in Applicants' claim 1. Applicants' claimed sensor structure therefore clearly distinguishes over Dorr and is neither taught nor suggested by the Dorr reference.

Schuller discloses structure of radio-opaque fiduciary elements positioned intermediate a radiation source and the surface of a radiation detector to cast an artifact shadow onto analog film. Schuller teaches that this fiduciary element's artifact shadow on film could be used to align radiographic images taken at different times, thereby facilitating the determination of time evolution of a dental structure.

The addition of fiduciary elements of Schuller to Dorr's structure or teachings fails to provide the missing elements claimed by Applicants in the subject claims.

Specifically, the addition of fiduciary elements from Schuller to Dorr's structure fails to provide for Applicants' claimed sensor's digital imaging surface structure or the claimed digitized data output from the sensor representing the desired projected images missing from Dorr. Additionally, in use, Applicants' device does not require multiple time evolved "snapshots" but delivers its information directly from the claimed digitized data output of the sensor in 'real time' without a prior image for contrast.

Schuller's addition of fiduciary elements therefore fails to add to Dorr essential missing structure claimed by Applicants, i.e., digital sensor, digital output, etc., necessary to sustain a basis for rejection of Applicants' claims. Accordingly, the combination of Dorr and Schuller, if possible, still fails to provide sufficient basis for rejection of Applicants' claims requiring a digital imaging surface and a digitized data output.

Claims 2-8 depend upon claim 1 and further delineate the inventive structure by

adding additional structural limitations. As such, applicant further believes that they also are patentable over both the Dorr and Schuller references, or any reasonable combination, if possible, of the Dorr and Schuller reference teachings. Applicant therefore respectfully requests the withdrawal of the rejection of these claims and their passage to allowance.

Claims 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,434,418 to Schick ("Schick") in view of U.S. Patent No. 1,286,251 to Dorr.

Schick discloses a radiation sensor having a housing with an integrally formed digital radiation detector. Dorr has been discussed and analyzed above.

Claim 9, upon which the other cited claims depend, has been amended to clarify and distinguish more clearly over the cited references of Schick and Dorr.

Specifically, the present invention in claim 9 claims a digital radiation sensor for use with a digital radiography imaging system for intraoral placement in a mouth of a patient for production of radiographs of teeth and supporting structures. Applicants' digital sensor has a digital imaging surface contained in a housing with at least two, generally planar, digital radiation detectors abutting at a non-zero angle to form a faceted, generally contiguous digital imaging surface oriented toward a radiation source. The housing is further shaped to conform to the anatomic curvatures of the human maxillary and mandibular arches of the average patient. There is at least one radio-opaque fiduciary element casting a projected image on the sensor's digital imaging surface when illuminated by a radiation source for determining an unknown angle of incidence between the radiation source and said imaging surface. This sensor, as claimed, provides a digitized data output representing the projected image of a fiduciary element, as well as teeth and their anatomical supporting structures of bone, periodontal ligaments and

gingiva around the root and cervical region of the tooth made on the sensor's digital imaging surface for use in a digital radiography imaging system that uses the projected distorted image shape of the fiduciary element onto the sensor's digital imaging surface for comparison against a known non-distorted projected image shape of the fiduciary element in order to generate a corrective transformation for correcting projected distortions in the data representing the projected images on the sensor's digital imaging surface.

Schick admittedly fails to disclose two planar digital radiation detectors abutting at a non-zero angle to form a contiguous imaging surface and Dorr is called upon to provide this missing structure. However, with the claims as amended, the Schick/Dorr reference structures in any reasonable combination continue to fail to provide, either explicitly or implicitly, for Applicants' claimed structure appearing in the subject claims of a radio-opaque fiduciary element positioned intermediate the digital imaging surface and the radiation source, and for a digitized data output representative of the projected images on the digital imaging surface. Without supplying such claimed structure, and neither teaching nor suggesting it, Schick and Dorr cannot provide a valid basis for rejection of the subject claims. Accordingly, withdrawal of the rejection of these claims is respectfully requested and the claims passed to allowance.

Claim 12 is rejected under 35 U.S.C. 103(a) over Schick in view of Dorr as applied above to claim 9, and further in view of U.S. Patent No. 6,811,312 B2 to Bratslavsky et al. ("Bratslavsky").

Bratslavsky is argued to disclose a holding tab removably attached to a radiation sensor for positioning the sensor relative to teeth.

Claim 12 depends from claim 9 further adding defining and limiting structure. As analyzed above, Claim 9 is believed patently distinct from the Schick and Dorr references in at least claiming a radio-opaque fiduciary element positioned intermediate the digital imaging surface and the radiation source, and for a digitized data output representative of the projected images on the digital imaging surface. Bratslavsky fails to provide for this claimed structure. Without supplying such claimed structure, and neither teaching nor suggesting it, Bratslavsky even in combination with Schick and Dorr fails to provide a valid basis for rejection of the subject claims. Accordingly, withdrawal of the rejection of claim 12 is respectfully requested and that claim 12 be passed to allowance.

Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over an article published by Schulze and d'Hoedt appearing in Dentomaxillofacial Radiology (2002) 31, 32-38. (Claim 14 has been canceled rendering this rejection moot for claim 14.) Claim 15 is rejected on these same grounds and further in view of U.S. Patent No. 6,196,715 B1 to Nambu et al. ("Nambu").

Schulze and d'Hoedt's article discloses a method for correcting distortions in the image generated from an intraorally placed radiation sensor used with a digital radiography imaging system. This method determines angular disparities in paralleling X-ray projection by quantitative analysis of the elliptical shape of two spherical references and by location of their shadows onto the imaging plane based on a measurement of the magnification of the spheres to determine the actual inclination of the spheres to a specified receptor axis. Prerequisites for this method are a true perpendicular orientation of the central X-ray to a fixed, known datum reference frame and the use of two reference spheres attached to the object of interest with their main axis aligned with

the object.

Nambu discloses a method that provides at least one radio-opaque fiduciary element on the housing of a radiation detector.

Claim 13 has been amended to clarify the step of placing at least one radio-opaque fiduciary element intermediate the radiation source and the imaging surface of the sensor and to require that the radio-opaque fiduciary element be positioned in a fixed spatial relation to the imaging surface of the sensor. As amended, it is believed that claim 13 is patently distinctive over the cited references either singly or in any reasonable combination for at least the reasons analyzed below.

Schulze and d'Hoedt's structure requires that its two reference spheres be "temporarily attached to an object with their main axis aligned with the object." Article page 33, left column, lines 6 *et seq.*, also reiterated at Article page 37, right column, lines 12 *et seq.* , and at ***idem*** lines 29 *et seq.* All of these citations show that Schulze and d'Hoedt's structure requires that the reference spheres be attached not in a fixed relation to the sensor's imaging plane, but to a plane created by the object of interest itself in direct contradiction to Applicants' claimed step of holding the fiduciary elements in a fixed spatial relation to the sensor's imaging plane and not attaching them to the variable orientations of the plane defined and created by object being imaged. Schulze and d'Hoedt's positioning of their reference spheres cannot be altered to the structure being claimed by Applicants, i.e., positioning them in a fixed spatial relation to the sensor imaging plane, without rendering their method inoperable. This is because Schulze and d'Hoedt use their reference spheres attached to the object of interest to determine the orientation of a plane formed by the object of interest with the imaging plane which is

held perpendicular to the X-ray source. On the other hand, Applicants claim a method that determines the orientation of the sensor's imaging plane with respect to the radiation source and not other objects that may be imaged on the imaging plane. The difference between the two methods is in what is being imaged, the orientation of the subject object with regard to the X-ray source (the imaging plane held perpendicular) (Schulze and d'Hoedt), or the reference fiduciaries with regard to the imaging plane which is allowed variable, unknown orientation with regard to the X-ray source (Applicants).

Visually, as shown in Schulze and d'Hoedt's figures, Schulze and d'Hoedt's imaging plane is always shown as being perpendicular to the X-ray source while the object of interest, having the attached reference spheres, defines a plane non-perpendicular to the X-ray source (compare Article Figs. 1, 2, 3 with Applicant FIGS. 1a through 3b where the imaging plane is shown as being non-perpendicular to the X-ray source.)

Fundamentally these two methods differ in both approach and structure. Schulze and d'Hoedt measure the variable spatial orientation of an object with regard to an imaging plane having a known (perpendicular) and fixed orientation to an X-ray source while Applicants claim a method to correct distortions caused by projection of X-rays onto an imaging plane having an unknown spatial orientation with regard to the source of the X-rays (by fixing their fiduciaries with regard to the imaging plane in a known spatial orientation). In Schulze and d'Hoedt it is the skewed orientation of the object being imaged that is unknown and to be determined (that is why the reference spheres must be attached to the object being imaged), the orientation of the imaging plane being known, while in Applicants' claimed method it is the skewed orientation of the imaging plane

with regard to the X-ray source that is being determined.

By clarifying the claims to show that Applicants' fiduciaries are placed in a fixed, known spatial orientation to the sensor imaging plane, Applicants believe that the patentable distinction between the claims and the cited references is clear and respectfully requests that the rejection of their claims be withdrawn and the claims passed to allowance.

Claim 15 is rejected based on Schulze and d'Hoedt's Article analyzed above and further in view of U.S. Patent No. 6,196,715 B1 to Nambu et al. ("Nambu").

Nambu discloses a method that provides a radio-opaque fiduciary element on the housing of a radiation detector.

As analyzed above, holding the fiduciary elements in a fixed relation to the sensor imaging plane cannot be done in the Schulze and d'Hoedt disclosure without rendering it inoperative. Therefore, any attempt to combine the Nambu reference with Schulze and d'Hoedt results in an inoperative structure.

Since claim 15 depends from claim 13, analyzed above to be patentable over the cited reference of Schulze and d'Hoedt, and claims further limiting structure in its claimed method steps, it is also believed to be patentable over the cited references. Withdrawal of the rejection of claim 15, and its allowance is respectfully requested.

In conclusion, Applicant has responded to pending Office Action dated May 23, 2006 by amending the claims making them more definite as to the subject matter being claimed, and by distinguishing the claimed invention as being patentable over the references cited by the Examiner in refusing allowance. With this response Applicant believes the application to now be in condition for allowance, and allowance of the

application is respectfully requested. If the Examiner disagrees with Applicant, or feels that additional clarification is necessary, Applicant's attorney respectfully requests that the Examiner call Applicant's attorney to determine if the issue can be resolved prior to issuance of an additional office action in this matter.

Applicants also request a one month extension of time to file this response and have included a check in the amount of the required extension fee.

Respectfully submitted,

Date: September 22, 2006

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CERTIFICATE OF MAILING (37 C.F.R. 1.8(a))

I hereby certify that this paper (along with any paper referred to as being transmitted therewith) is being deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

September 22, 2006

Matthew F. Jodziewicz